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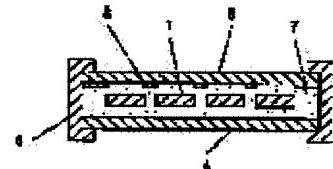
(21)Application number : 06-116995 (71)Applicant : KYOCERA CORP  
 (22)Date of filing : 30.05.1994 (72)Inventor : MASUTOSHI KENJI

## (54) SOLAR BATTERY MODULE

### (57)Abstract:

**PURPOSE:** To prevent a solar battery module from giving a complicated impression to a person when the person looks at the module from the top and, at the same time, to reduce the reflection of sun's ray by coloring light transmissive glass in almost the same color as that of a frame member except the parts facing solar battery elements.

**CONSTITUTION:** A light transmissive glass plate 5 is provided on the surface side of solar battery elements 1 and a frame member 6 made of aluminum, etc., is provided at the peripheries of the glass plate 5 and a rear surface member 4. At the time providing the frame member 6, the glass plate 5 is colored in almost the same color 8 as that of the member 6 except the parts facing the elements 1. Namely, when the member 6 is colored in a silver color, the glass plate 5 is also colored in the silver color except the parts facing the elements 1 so that a solar battery module can be colored in almost the same color as a whole. Therefore, the module does not give any complicated impression to a person when the person looks at the module from the top and the number of colors to be visually confirmed is reduced. Moreover, the reflection, etc., of sun's ray by the glass plate 5 is prevented to the utmost.



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**CLAIMS****[Claim(s)]**

**[Claim 1] The solar cell module characterized by performing the almost same coloring as said frame member to said translucency glass except the part which stands face to face against said solar battery element in the solar cell module which connected two or more solar battery elements electrically, pinched between a rear-face member and translucency glass, and prepared the frame member in the periphery section of this rear-face member and translucency glass.**

**[Claim 2] The solar cell module according to claim 1 characterized by said solar battery element presenting the almost same color as said frame member.**

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**DETAILED DESCRIPTION****[Detailed Description of the Invention]**

[0001]

[Industrial Application] This invention relates to a solar cell module.

[0002]

[Description of the Prior Art] As shown in drawing 2, the conventional solar cell module connected two or more solar battery elements 11 with lead wire 12 and the horizontal wiring 13, pinched them with the rear-face member 14 and translucency glass 15, formed this rear-face member 14 and the frame member 16 which changes from aluminum etc. to the periphery section of translucency glass 15, and was constituted. In addition, a solar battery element 11 is pasted up on the rear-face member 14 and translucency glass 15 by translucency resin 17, such as ethylene vinyl acetate.

[0003]

[Problem(s) to be Solved by the Invention] However, in this conventional solar cell module, while it was complicated since a solar battery element 11, lead wire 12, the horizontal wiring 13, the rear-face member 14, translucency glass 15, and the frame member 16 were checked by looking when plane view was carried out, there was a problem that there was much color and it spoiled a fine sight. Moreover, the reflected light was carried out, it nursed and there was also a problem of it being said that a person is dazzled in translucency glass 15. It is requested that especially the solar cell module installed in a residence, a park, etc. is \*\*(ed) by the surrounding environment.

[0004] While accomplishing this invention in view of such a problem, concealing parts other than a solar battery element as much as possible and also lessening color checked by looking as much as possible, it aims that sunlight reflects with translucency glass etc. at offering the solar cell module prevented as much as possible.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned object, the solar cell module concerning this invention connected two or more solar battery elements electrically, and pinched them with a rear-face member and translucency glass, and the almost same coloring as said frame member was performed to said translucency glass except the part which stands face to face against said solar battery element in the solar cell module which prepared the frame member in the periphery section of this rear-face member and translucency glass.

[0006]

[Function] It can be prevented as much as possible except the part which stands face to face against the solar battery element of translucency glass although a solar battery element, lead wire, a frame member, and translucency glass will be checked by looking when plane view of the solar cell module is carried out if constituted as mentioned above that the color which does not give a complicated impression and is moreover checked by looking also decreases, and sunlight reflects with translucency glass further from the almost same coloring as a frame member being performed etc.

[0007]

[Example] Hereafter, the example of this invention is explained to a detail based on an accompanying drawing.

[0008] Drawing 1 is the top view and sectional view showing one example of the solar cell module concerning this invention, and, for lead wire and 3, as for a rear-face member and 5, horizontal wiring and 4 are [ 1 / a solar battery element and 2 / translucency glass and 6 ] frame members.

[0009] A solar battery element 1 prepares the antireflection film (un-illustrating) which consists of the silicon nitride (SiNx) film etc. in a front face, and is constituted while preparing the p-n junction section (un-illustrating) for example, in a silicon substrate and preparing the ctenidium-like electrode (un-illustrating) which changes

from silver etc. to a front face and a rear face. The color which a solar battery element 1 presents can be changed with the thickness of this antireflection film. For example, if the optical refractive index of an antireflection film is  $n=2.1$ , if the thickness is set as 650–850A, a solar battery element 1 will become blue, and if the thickness is set as 450–650A, it will become brown, and it will become silver if the thickness is further set as 450A.

[0010] This solar battery element 1 is connected to a serial with the lead wire 2 which consists of silver etc. Moreover, the solar battery element 1 of an edge is connected to a serial parallel with the horizontal wiring 3 so that a desired output may be obtained.

[0011] The rear-face member 4 is arranged in the rear-face side of a solar battery element 1. This rear-face member 4 is formed in order to protect a solar battery element 1 from moisture, and it consists of members which coated the table rear face of aluminum foil with the fluororesin etc.

[0012] Translucency glass 5 is arranged in the front-face side of a solar battery element 1. It fills up with translucency resin 7, such as ethylene vinyl acetate, between translucency glass 5 and the rear-face member 4. Coloring objects, such as a silica ( $\text{SiO}_2$ ), may be made to mix among this translucency resin 7 into the translucency resin by the side of the rear face of a solar battery element 1. In addition, when using a silica ( $\text{SiO}_2$ ) as a coloring object, translucency resin 7 becomes white.

[0013] The frame member 6 which consists of aluminum etc. is formed in the periphery section of translucency glass 5 and the rear-face member 4. You may color, although this frame member 6 presents silver fundamentally. What is necessary is to apply heat-curing mold acrylic resin and the fluororesin which added the blue system pigment and the brown system pigment, or for electropainting just to color, after performing alumite processing when coloring.

[0014] The almost same coloring 8 as the frame member 6 is performed also to translucency glass 5 other than the part against which a solar battery element 1 stands face to face. Namely, when coloring it a blue system, the lead borosilicate glass containing pigments, such as cobalt oxide ( $\text{CoO}$ ), etc. colors. When coloring it a brown system, the lead borosilicate glass containing pigments, such as 3 ferric oxide, the second chromium of 3 oxidation, and a zinc oxide ( $\text{Fe}_2\text{O}_3\text{-Cr}_2\text{O}_3\text{-ZnO}$ ), etc. colors. When coloring it a silver system, the lead borosilicate glass containing pigments, such as titanium oxide ( $\text{TiO}_2$ ), and copper oxide, a chromium trioxide, manganese oxide ( $\text{CuO-Cr}_2\text{O}_3\text{-MnO}$ ), etc. colors. That is, coloring 8 is performed by dissolving these lead borosilicate glass into pineapple oil and ethyl cellulose, printing into the predetermined part of translucency glass 5, and being burned at the temperature of about 630 degrees C. In addition, the coloring 8 performed to translucency glass 5 may be a front-face [ of translucency glass 5 ], or rear-face side.

[0015] A silver system is also colored translucency glass 5 other than the part against which a solar battery element 1 stands face to face when the frame member 6 is a silver system, a blue system is also colored translucency glass 5 other than the part against which a solar battery element 1 stands face to face when the frame member 6 is a blue system, and when the frame member 6 is a brown system, a brown system is also colored translucency glass 5 other than the part against which a solar battery element 1 stands face to face.

[0016] When the frame member 6 and the predetermined part of translucency glass 5 are furthermore silver systems Using the solar battery element which also colors a solar battery element 1 in a silver system, when the frame member 6 and the predetermined part of translucency glass 5 are blue systems Using the solar battery element which also colors a solar battery element 1 in a blue system, when the frame member 6 and the predetermined part of translucency glass 5 are brown systems, the whole solar cell module using the solar battery element which also colors a solar battery element 1 in a brown system can be made into about 1 color.

[0017]

[Effect of the Invention] As mentioned above, according to the solar cell module concerning this invention, connect two or more solar battery elements electrically, and it pinches between a rear-face member and translucency glass. In the solar cell module which prepared the frame member in the periphery section of this rear-face member and translucency glass From having performed the almost same coloring as a frame member to said translucency glass except the part which stands face to face against a solar battery element Also when plane view of the solar cell module is carried out, there is also little color which does not give a complicated impression and is moreover checked by looking, and it serves as a solar cell module which \*\*(ed) by the surrounding environment. Moreover, from \*\*\*\*\* which colors it the predetermined part of translucency glass, it can also be reduced that sunlight reflects with this translucency glass.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1] It is drawing showing one example of the solar cell module concerning this invention, and (a) is a top view and (b) is a sectional view.

[Drawing 2] It is drawing showing the conventional solar cell module, and (a) is a top view and (b) is a sectional view.

**[Description of Notations]**

1 [ ... A rear-face member, 5 / ... Translucency glass, 6 / ... A frame member, 8 / ... Coloring ] ... A solar battery element, 2 ... Lead wire, 3 ... Horizontal wiring, 4

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(71)出願人 000006633

京セラ株式会社

京都府京都市山科区東野北井ノ上町5番地  
の22

(72)発明者 増利 賢治

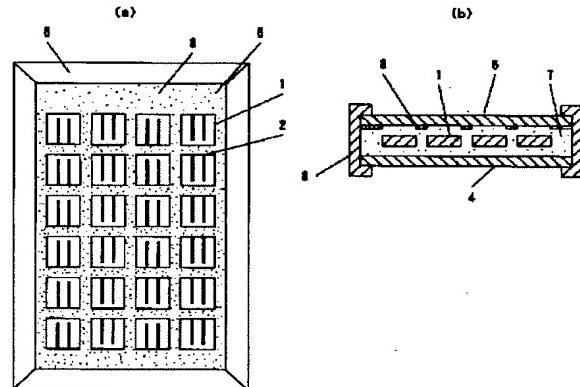
滋賀県八日市市蛇溝町長谷野1166番地の6  
京セラ株式会社滋賀工場内

(54)【発明の名称】 太陽電池モジュール

(57)【要約】

【構成】 複数の太陽電池素子1を電気的に接続して裏面部材4と透光性ガラス5間に挟持し、この裏面部材4と透光性ガラス5の周縁部にフレーム部材6を設けた太陽電池モジュールにおいて、太陽電池素子1と対峙する部分を除いた前記透光性ガラス5に、フレーム部材とほぼ同一の着色8を施した。

【効果】 視認される色彩が少ないので、太陽電池モジュールが煩瑣な印象を与えることはなく、周囲の環境に則した太陽電池モジュールとなり、また透光性ガラス5で太陽光が反射することも低減できる。



## 【特許請求の範囲】

【請求項1】複数の太陽電池素子を電気的に接続して裏面部材と透光性ガラス間に挟持し、この裏面部材と透光性ガラスの周縁部にフレーム部材を設けた太陽電池モジュールにおいて、前記太陽電池素子と対峙する部分を除いた前記透光性ガラスに、前記フレーム部材とほぼ同一の着色を施したことを特徴とする太陽電池モジュール。

【請求項2】前記太陽電池素子が前記フレーム部材とほぼ同一の色彩を呈することを特徴とする請求項1に記載の太陽電池モジュール。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は太陽電池モジュールに関する。

## 【0002】

【従来の技術】図2に示すように、従来の太陽電池モジュールは、複数の太陽電池素子11をリード線12と横配線13で接続して裏面部材14と透光性ガラス15で挟持し、この裏面部材14と透光性ガラス15の周縁部に、アルミニウムなどから成るフレーム部材16を設けて構成されていた。なお太陽電池素子11は、エチレン・ビニル・アセテートなどの透光性樹脂17で裏面部材14と透光性ガラス15に接着される。

## 【0003】

【発明が解決しようとする課題】ところがこの従来の太陽電池モジュールでは、平面視した場合、太陽電池素子11、リード線12、横配線13、裏面部材14、透光性ガラス15およびフレーム部材16が視認されるために煩瑣であると共に、色彩が多くて美観を損ねるという問題があった。また透光性ガラス15での反射光し、看者を眩惑するというという問題もあった。特に、住宅や公園などに設置される太陽電池モジュールは、周囲の環境に則したものであることが要望されている。

【0004】本発明はこのような問題に鑑みて成されたものであり、太陽電池素子以外の箇所はできるだけ隠蔽し、視認される色彩も極力少なくすると共に、透光性ガラスで太陽光が反射することなどを極力防止した太陽電池モジュールを提供することを目的とする。

## 【0005】

【課題を解決するための手段】上記目的を達成するために、本発明に係る太陽電池モジュールは、複数の太陽電池素子を電気的に接続して裏面部材と透光性ガラスで挟持し、この裏面部材と透光性ガラスの周縁部にフレーム部材を設けた太陽電池モジュールにおいて、前記太陽電池素子と対峙する部分を除いた前記透光性ガラスに、前記フレーム部材とほぼ同一の着色を施した。

## 【0006】

【作用】上記のように構成すると、太陽電池モジュールを平面視した場合に視認されるのは、太陽電池素子、リ

ード線、フレーム部材および透光性ガラスであるが、透光性ガラスの太陽電池素子と対峙する部分以外は、フレーム部材とほぼ同一の着色が施されていることから、煩瑣な印象を与えることはなく、しかも視認される色彩も少くなり、さらに透光性ガラスで太陽光が反射することなども極力防止できる。

## 【0007】

【実施例】以下、本発明の実施例を添付図面に基づき詳細に説明する。

10 【0008】図1は、本発明に係る太陽電池モジュールの一実施例を示す平面図と断面図であり、1は太陽電池素子、2はリード線、3は横配線、4は裏面部材、5は透光性ガラス、6はフレーム部材である。

【0009】太陽電池素子1は、例えばシリコン基板内にp-n接合部(不図示)を設け、表面と裏面に銀などから成る櫛歯状電極(不図示)を設けると共に、表面に窒化シリコン(SiNx)膜などから成る反射防止膜(不図示)を設けて構成される。太陽電池素子1が呈する色彩は、この反射防止膜の厚みによって変化させることができる。例えば反射防止膜の光屈折率がn=2.1であれば、その厚みを650~850Åに設定すると太陽電池素子1は青色になり、またその厚みを450~650Åに設定すると茶色になり、さらにその厚みを450Åに設定すると銀色になる。

【0010】この太陽電池素子1を銀などから成るリード線2で直列に接続する。また、端部の太陽電池素子1は、所望の出力が得られるように横配線3で直並列に接続する。

【0011】太陽電池素子1の裏面側には、裏面部材4が配設される。この裏面部材4は、湿気から太陽電池素子1を保護するために設けられるものであり、アルミ箔の表裏面にフッ素樹脂などをコーティングした部材で構成される。

【0012】太陽電池素子1の表面側には、透光性ガラス5が配設される。透光性ガラス5と裏面部材4の間に、エチレン・ビニル・アセテートなどの透光性樹脂7が充填される。この透光性樹脂7のうち、太陽電池素子1の裏面側の透光性樹脂中にはシリカ(SiO<sub>2</sub>)などの着色物を混入させてもよい。なお着色物としてシリカ(SiO<sub>2</sub>)を用いる場合、透光性樹脂7は白色になる。

【0013】透光性ガラス5と裏面部材4の周縁部には、アルミニウムなどから成るフレーム部材6が設けられる。このフレーム部材6は基本的に銀色を呈するが、着色を施してもよい。着色を施す場合、アルマイト処理を行った後に青色系顔料や茶色系顔料を添加した熱硬化型アクリル樹脂やフッ素樹脂を塗布したり、電着塗装により着色を施せばよい。

【0014】太陽電池素子1が対峙する部分以外の透光性ガラス5にも、フレーム部材6とほぼ同一の着色8を

施す。すなわち青色系に着色する場合、酸化コバルト ( $\text{CoO}$ ) などの顔料を含有する硼硅酸鉛ガラスなどで着色し、茶色系に着色する場合、三酸化第二鉄・三酸化第二クロム・酸化亜鉛 ( $\text{Fe}_2\text{O}_3 - \text{Cr}_2\text{O}_3 - \text{ZnO}$ ) などの顔料を含有する硼硅酸鉛ガラスなどで着色し、銀色系に着色する場合、酸化チタン ( $\text{TiO}_2$ ) と酸化銅・三酸化クロム・酸化マンガン ( $\text{CuO} - \text{Cr}_2\text{O}_3 - \text{MnO}$ ) などの顔料を含有する硼硅酸鉛ガラスなどで着色する。すなわちバイノイドとエチルセルロース中にこれらの硼硅酸鉛ガラスを溶解して透光性ガラス 5 の所定部分に印刷し、 $630^{\circ}\text{C}$ 程度の温度で焼き付けることによって、着色 8 を施す。なお透光性ガラス 5 に施す着色 8 は、透光性ガラス 5 の表面側でも裏面側でもよい。

【0015】フレーム部材 6 が銀色系である場合は、太陽電池素子 1 が対峙する部分以外の透光性ガラス 5 にも銀色系の着色を施し、フレーム部材 6 が青色系である場合は、太陽電池素子 1 が対峙する部分以外の透光性ガラス 5 にも青色系の着色を施し、フレーム部材 6 が茶色系である場合は、太陽電池素子 1 が対峙する部分以外の透光性ガラス 5 にも茶色系の着色を施す。

【0016】さらにフレーム部材 6 と透光性ガラス 5 の所定部分が銀色系である場合は、太陽電池素子 1 も銀色系に発色する太陽電池素子を用い、フレーム部材 6 と透光性ガラス 5 の所定部分が青色系である場合は、太陽電池素子 1 も青色系に発色する太陽電池素子を用い、フレーム部材 6 と透光性ガラス 5 の所定部分が茶色系である\*

\* 場合は、太陽電池素子 1 も茶色系に発色する太陽電池素子を用いる太陽電池モジュール全体をほぼ一色にすることができる。

#### 【0017】

【発明の効果】以上のように、本発明に係る太陽電池モジュールによれば、複数の太陽電池素子を電気的に接続して裏面部材と透光性ガラス間に挟持し、この裏面部材と透光性ガラスの周縁部にフレーム部材を設けた太陽電池モジュールにおいて、太陽電池素子と対峙する部分を除いた前記透光性ガラスに、フレーム部材とほぼ同一の着色を施したことから、太陽電池モジュールを平面視した場合にも煩瑣な印象を与えることはなく、しかも視認される色彩も少なく、周囲の環境に則した太陽電池モジュールとなる。また透光性ガラスの所定箇所に着色を施すことから、この透光性ガラスで太陽光が反射することも低減できる。

#### 【図面の簡単な説明】

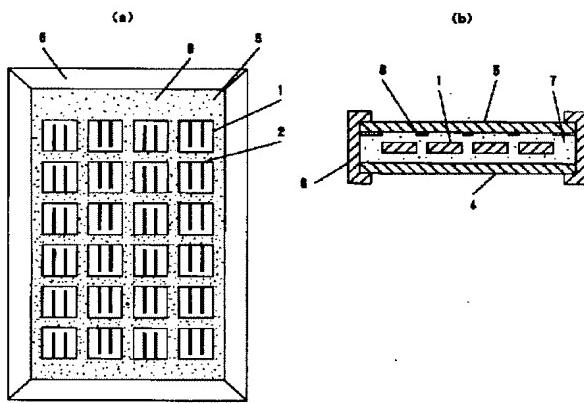
【図1】本発明に係る太陽電池モジュールの一実施例を示す図であり、(a) は平面図、(b) は断面図である。

【図2】従来の太陽電池モジュールを示す図であり、(a) は平面図、(b) は断面図である。

#### 【符号の説明】

1 … 太陽電池素子、2 … リード線、3 … 横配線、4 … 裏面部材、5 … 透光性ガラス、6 … フレーム部材、8 … 着色

【図1】



【図2】

